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ABSTRACT

This literature review is divided into two parts. The first part is a survey of materials in the William S. Gray Collection at the University of Chicago that deal with modes of learning. The studies reviewed range from the 1930s to the 1960s. The second part of the paper extends the review to studies published during the 1970s. Each section of the paper ends with a summary of conclusions and draws implications for research and teaching. (AA)

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Modes of Learning

Susan Patridge

Part I

A Survey of the Research in the Gray Collection

NDEA Institute, Summer of 1968

Part II

A Continuing Interest in Modes of Learning

The 1970's

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Introduction

I had wondered about modes of learning as they might relate to helping children to read. I was fortunate enough to be selected as a participant in a Reading Research Institute, sponsored by our federal government, and held at the University of Chicago in the summer of 1968. I felt it wise, while at the University, to take advantage of the William S. Gray Collection to investigate studies that had been made on modes of learning. Dr. Gray, the first President of our International Reading Association, was committed to the improvement of reading instruction, and he worked diligently toward that end until his death in 1960.

The aforementioned Institute generated a continuing interest in studies, books, magazine articles, etc., dealing with modes of learning. Part II of this paper addresses itself to this interest in the 1970's.

Review of the Research

An examination of the research, in the W. S. Gray Collection, on modes of learning, revealed research dating back to 1931, with Ralph V. Merry's study, "An Experiment in Teaching Tactual Reading to Seeing Subjects." (1) The study reported the results of the efforts of two Harvard undergraduate students of normal vision and intelligence to learn tactual reading.

After approximately five and one half hours of individual, intensive and distributed instruction, both students failed to reach first grade standards in tactual reading as measured by a Braille adaptation of the Gray Oral Reading Check Tests. Two forms of the test were used. One form was read tactually; an equivalent form was read visually. Obviously, each subject translated the Braille characters into visual images.

It is unfortunate that the small number of subjects included in the investigation precluded any sweeping generalizations.

Approximately a decade later, Bernardine G. Schmidt, (2) using "Tests of Associative Learning," by Gates, and "Diagnostic Tests of Visual and Auditory Associations in Reading," by Schmidt herself, screened 102 "auditory learners" from a group of 308 children. Fifty-one of this number were in the experimental group and received special auditory instruction; the remaining fifty-one, in the control group, received non-auditory instruction. The median IQ for the

experimental group was 72.5; for the control group 76.667. Each group received 135 clock hours of instruction.

In the experimental group, the average gain per pupil was 3.2 grades; in the control group, the gain was only 1.19 grades, though the median IQ of the group was slightly higher.

Miss Schmidt concluded, "If initial presentations are made by auditory methods, and varied associative abilities developed co-incident with the teaching of reading skills, auditory learners can reach a high level of thoughtful, silent reading."

Miss Schmidt's second "if" -- "if varied associative abilities are developed co-incident with the teaching of reading skills" -- seemed to negate the original purpose of the study.

"A Comparison of Learning and Retention of Materials Presented Visually and Auditorially," a study by T. S. Krawiec (3), compared the relative value of visual and auditory modes of presentation of nonsense syllables and three-letter monosyllabic nouns to sixty-seven college students. Statistical evidence supported agreement with previous studies which found the visual mode of presentation especially adapted for the learning of difficult verbal material. In regard to the auditory presentation, though it was distinctly inferior for learning; it was rarely inferior and sometimes slightly superior for retention. This bore a relation to investigations which, using advertising materials, found auditory presentation to be reliably superior for delayed recall.

Though there was, indeed, a paucity of research in the area of modalities in the 30's and 40's, nevertheless there were people, that long ago, who recognized that, perhaps, there were different ways of learning different material for different reasons, by different people, at different times.

During the 50's, the research in this area seems to have gained a little momentum, as some nine studies were found in the Gray Collection as compared to the three found in the two previous decades.

During the 50's, several studies were made of the effect of listening and training in listening upon reading achievement. (4) (5) Listening, as related to test scores was also studied during this period. (6) (7) (8) No studies were found which dealt with modality strength of the very young children. The majority of the studies seem to have been made with students above grade four.

A survey of the research on modalities, in the Gray Collection, for the first five years of the 1960's, appeared to deal mostly with children of the intermediate grades. Again there was a paucity of studies in the very beginning school grades. Several studies on the integration of sense modalities were done during this period.

Milton Budoff and Donald Quinlan (9) using as subjects, fifty-six second grade children of average intelligence from the same public school and from nonprofessional homes, studied reading progress as related to visual and aural learnings in the primary grades.

Meaningful words were presented aurally and visually in a paired-associate paradigm, and the rate of learning by auditory and visual presentations was compared by analysis of variance. Though the superiority of learning by aural modality presentations was maintained by both the retarded and average subjects, the retarded readers tended to be better auders and poorer visual learners than the average readers.

Herbert G. Birch and Lillian Belmont (10) made a study of auditory-visual integration, intelligence and reading ability in school children. Their subjects were 220 children with normal or corrected vision and hearing from a suburban elementary school. The children ranged in age from five years and three months to twelve years and one month and in grade from kindergarten through grade six.

Results of the study gave evidence that important intermodal relationships are being established during the first school years. A correlation of .70 (p .001) was found for the youngest group of children; a correlation of .42 (p .05) was obtained for the next oldest age group; and correlations which were not statistically significant were found for all the subsequent age-grade groups.

The authors suggested the possible importance of a detailed understanding of the development of such intermodal relations as found in their study. They suggested that this might be valuable in assessing the mechanisms underlying the readiness of a child to acquire primary knowledge and

educational skills.

As a result of two studies -- one by Sterritt and Rudnick (11) and the second by Sterritt, Rudnick and Flax (12), certain trends were noted.

The studies were concerned with auditory and visual rhythm perception and reading ability. The subjects of the first study were thirty-six fourth grade boys above average in intelligence and reading; the subjects of the second study were thirty-six third grade boys of equally high intelligence and reading achievement.

In the first study, it was supported statistically that neither the auditory-visual nor the visual tests contributed to the variance accounted for by intelligence. The auditory test did, however, contribute 23% to the 46% of variance accounted for by intelligence.

In the second study, both the visual and auditory tests added to the variance accounted for by the intelligence test; the auditory-visual, however, made no contribution.

In summation, visual perceptual abilities decline in importance from grade three to grade four and auditory and/or cross modal perceptual abilities become more important at this time.

The findings were in harmony with those of Myklebust (13) whose reported data showed progressive relative retardation in the reading vocabularies of deaf children between nine and fifteen years of age.

In another study in the late sixties, the effects of

stimulus modality and familiarity on verbal discrimination were investigated by Phyllis A. Katz. (14)

Her subjects were seventy-two Negro boys from grades two, four, and six in the Harlem area of New York City. In order to determine the effect of stimulus familiarity on discrimination performance, familiar and unfamiliar verbal stimuli were used, that is, English and Hebrew words were presented.

Results of the study, supported by a four-way analysis of variance, indicated that, apparently, both perceptual skill and familiarity factors play a role in discrimination performance as do age and reading ability.

Miss Katz suggested further research to determine the extent to which background variables might be involved in the development of modality-specific behavior.

Suzanne D. Hill and Elynordel E. Hecker (15) investigated auditory and visual learning of a paired-associate task by second grade children. In selecting the thirty-two children on whom they made the study, they used the same criteria of eligibility as was used by Budoff and Quinlan (16) whose findings they were questioning: "If the visual material had been presented in the form of pictures rather than words, would the auditory presentation retain its superiority"?

Subjects were given the lists in counterbalanced order with approximately one hour between presentations. The Kodak Carousel Slide Projector was used for the visual presentation, and the Wollensak magnetic tape recorder to present the

auditory stimuli.

Results, submitted to an analysis of variance, found neither sense modality nor order contributing significantly to the variance, but significant interaction was found. ($F=17.87$, $p<.001$). Results suggested, then, that when task difficulty is equated, the rate of learning a single task is not affected by the mode of stimulation; however, they suggested that, for second grade children, visual presentation of verbal material formed a broader base for transfer than the auditory.

Cooper and Gaeth (17) using 932 students selected at random from grades four, five, six, ten, and twelve in the Detroit Public Schools, made a study of interactions of modality with age and with meaningfulness in verbal learning. Consonant-vowel-consonant nonsense syllables and three-letter nouns were the materials used. It was found that the visual presentation of the nonsense syllables was superior to the auditory across all levels. The noun associations, however, were learned more readily through visual presentations in the lower grades, four, five, and six and through auditory presentations in grades ten and twelve. A three-way analysis of variance resulted in significant interactions: Grade X Modality and Modality X Material.

Robert N. Singer and Jason W. Brunk (18) did a study on the relation of perceptual-motor ability in elementary school children in grades three and four.

The ninety-one children, forty-eight in grade three and

forty-three in grade four, were from upper middle-class families. They were administered a series of perceptual-motor tasks, the Pintner Test, and the Stanford Achievement Test. The results confirmed the hypothesis that some children display a motoric style, others a conceptual style as described by Miller and Swanson, who, in 1960, defined these two expressive styles somewhat like this -- the former characterized by heavy use of voluntary muscles, the latter by facility in the manipulation of ideas. (19)

Singer and Brunk found positive, and, in some cases, significant relationships between perceptual-motor ability and intellectual ability, but they warned that the significance of the correlations be accepted with great reservation, for the highest correlation accounted for only .08 of the total variance.

They suggested that perhaps the largest relation between perceptual-motor variables and verbal materials occurs in early childhood, as achievement becomes more task specific with age.

Summary and Comparisons

Some conclusions drawn from the survey of the research in the Gray Collection on modes of learning follow:

1. Seemingly, the acquisition of differential knowledge, by different people, at different times, was affected by different learning modes and/or modal integration.

2. There seemed to be a paucity of research in the area of modalities with the very young children as subjects.

3. In the discussion of findings, the use of so many "ifs" by the researcher seemed to negate the original purpose of the study.

4. In some of the modality studies, there was no mention of the subjects' visual and hearing efficiency.

5. For the most part, the studies were on groups of children. It is likely that there might have been individuals for whom the findings would not have been applicable because of additional variables peculiar to the individual.

6. The tests used in some studies were of an experimental nature; therefore, their reliability might be questioned.

7. Some of the tests were of the clinical type, and for individual use. This precludes their use with large school populations.

8. Some investigators, using the same criteria of eligibility in the selection of subjects, obtained different, even opposite results.

9. Research designs improved somewhat between the

early 30's and the late 60's, and statistical procedures became more definitive.

10. The research of the late 1950's included studies of the relationship between perceptual-motor ability and reading achievement. It also included studies on modality strengths in the disadvantaged.

11. Many of research studies raised questions for further studies.

12. Bias was detected in some research reports.

13. Some reports omitted information which might have made interpretation easier and, possibly more accurate.

Implications

My survey, during the summer of 1968, of the research on modes of learning, found in the Gray Collection, led me to imply several things:

1. There was a great need for research on modalities at the primary level.

2. There was a need for more definitive testing instruments.

3. There was need for a better writing style if the reports were to be interpreted accurately by teachers, or even read by them, for that matter.

4. There seemed to be a lack of communication between the researcher and those in a position to further test, improve upon, and up-date his findings.

Modes of Learning -- the 1970's

At the time of the Institute mentioned earlier,[1] this writer learned of a longitudinal modality study being made by Mrs. Helen M. Robinson. (20) A brief report of the study follows:

The purpose of Mrs. Robinson's study[2] was to determine the reading progress, through third grade, made by pupils with differing visual and auditory abilities when they were taught by two approaches to beginning reading. Children who scored high on tests of visual perception and low on tests of auditory perception were taught by a whole word approach; those who scored high on the auditory perception tests and low on tests of visual perception were taught by a phonic approach.

Her subjects taught by the visual approach were identified among 232 in twelve classrooms from two school systems using a sight approach; those taught by the phonic approach were identified among 216 in ten classrooms using the Hay-Wingo materials.

Mrs. Robinson hypothesized that groups of children, entering first grade, and scoring high on both auditory and visual perceptual tests, would do well in reading regardless

[1] 1968

[2] See statement by Dr. A. J. Harris; Reading Teacher, March 1976

of the approach (phonic or sight) used. Similar groups, scoring low on both auditory and visual perceptual tests, would find reading difficult regardless of the approach used. Pupils ranking high on visual and low on auditory perception tests would make greater progress if taught by a sight approach. Those ranking low on visual and high on auditory perception tests would make greater progress if taught by a phonic approach.

She found that subjects who scored high in both modalities achieved higher reading scores, both at first and third grades, than those limited in either modality; those with low visual and auditory scores made the least progress by either a phonic or a sight approach. She found, too, that for those children with one strong and one weak modality, neither method surpassed the other. Therefore, the first two hypotheses were accepted, and the last two were rejected.

The study revealed that auditory discrimination made a significant contribution to achievement in reading at both first and third grades, regardless of the teaching method used.

A few of Mrs. Robinson's explanatory remarks are offered for the reader's better interpretation of the study:

She explained that with the tests used in her study, the number of children who could be classified as High-Visual and Low-Auditory (about 6%) and Low-Visual and High-Auditory (about 5%) was very small, and attrition during the three years made it even smaller.

A close relationship between the visual perception tests (Goins battery) and the intelligence test (The SRA Primary Mental Abilities Test) was called unfortunate by Mrs. Robinson as it may have masked some relationships which could have been found with another intelligence test.

The subjects with deficits in either visual or auditory abilities also had low IQ's; those low in both abilities appeared to be most limited in intelligence as determined by the test used.

Morency and Wepman (21) reported a study designed to explore early perceptual processing ability and its effect on later school achievement.

Their subjects, all Caucasian, were from two schools in a middle-class area of a suburb of Chicago. They met the following criteria:

1. Adequate auditory and visual acuity
2. Adequate intellectual ability as measured by the Lorge-Thorndike Intelligence Tests
3. Remained in the school system for the six years of the study
4. Were attending Grade one for the first time.

At the end of the six years, 120 of the 250 children initially tested in Grade one met all the criteria.

Results of the continuing study (Grade one through Grade six) revealed that a child whose perceptual development is slow at the time he enters school, does not ever catch up in achievement, though his perceptual processing ability is

fully developed by age nine.

The investigators concluded that though most children learn by whatever means they are taught, there are definitely those who are not ready to learn by "any means," because one of the perceptual pathways is slow in developing and, therefore, not functioning adequately.

They recommended that these children should be identified and taught in the way they can learn best, that is, they recommended early modality grouping and instruction which uses for each child the modality that is best developed. They added that another solution might be to try to improve the less-developed modality through direct intervention but that research into the value of this is needed.

At the International Reading Association Convention, held in New Orleans in May of 1974, Leo V. Rodenborn (22) of University of Missouri, St. Louis, presented a paper, "Modalities of Learning." Dr. Rodenborn proposed prognosis testing through teaching-learning situations rather than modality-type testing. In the latter, he claimed that the severely-disabled reader's short attention span and poor self-concept adversely influenced test results and, consequently, the child's preferred learning style was not determined.

A report on a modality study, by Robert McCracken (23) appeared in the October 1974 issue of the Reading Teacher[3]; it was entitled, "A Comparative Study of Modalities in

[3] An IRA publication

Beginning Reading Instruction."

Dr. McCracken stated, "The work reported in this article was concerned with the sense of taste, the sapiditory modality, although it is recognized that one source of contamination may be the olfactory modality." He felt that the learning styles have ignored the senses of taste and smell.

He stated his purpose thus: "to determine if children who were taught using the sapiditory modality learned effectively when the sapiditory modality was used alone or in combination with auditory, visual, and kinesthetic modalities."

The subjects, all children of poverty, were 240 kindergarten and 240 grade one children. They were assigned randomly to one of twelve treatment groups, eleven using a learning mode alone or in combination, and the twelfth serving as a control group. The children in the eleven groups were taught for thirty minutes a day for twenty weeks. The control group received no teaching whatever; they read picture books in the library for the thirty minutes.

The children in the sapiditory group were required to eat the words (Alpha-bit words[4]) for the full thirty minutes.

The control group received the best reading scores. However, it was learned that the librarian had permitted the children to check out the books; this invalidated the scores.

Dr. McCracken concluded: "Since children learn equally well by each of the four modalities, it should be salubrious to determine which of the four modalities should be used in

[4] A letter shaped cereal

teaching children." He added a word of warning about seeking the advice of a child's doctor before assigning an overweight child to the sapiditory model for group instruction.

For those interested, the "Crossfire" section of the January and February 1975 issues of the Reading Teacher each contained a reaction to the McCracken article.

William H. Gaddes (24) reported success in teaching Michael, a boy with congential bilateral brain damage, to read, write, and spell by a tactile method. This method was selected on the basis of Michael's average stereognosis (tactile form recognition), his "common-sense" comprehension, and his visual perception for small detail. His father cut out large plywood letters for him to handle, and both parents gave him constant tutorial help. The result was that he progressed from being able to read only a few letters and to write nothing, at age seven and a half, to being able, at age twelve, to read orally at an above-average level for his age on a standardized test. The prognosis was that Michael would be economically independent in a sheltered workshop environment.

Dr. Wepman (25), in his contribution to the compilation dealing with perceptual and learning disabilities in children, again stated his feelings about the importance of modality preference and the corresponding instructional method. "Homogeneous grouping for educational purposes in kindergarten through third grade, both by modality preference of the children and by the modality orientation of the instructional method -- auditory versus visual -- seems an important

area to study," he wrote.

He also suggested that a reconsideration of current classification of exceptional children is suggested by an understanding of modality differences and different rates of modality-bound development. He cited the case of a previously diagnosed severely retarded twelve year old child who had adequate visual perception but demonstrated an almost total lack of auditory perception. A year of training building on his adequate visual skills resulted in a gain of thirty points in his measurable IQ; he was no longer considered mentally retarded.

He cited another case which he said "can be multiplied by similar cases." The child, age fifteen, had average intellectual ability, excellent motivation for physical activities (sports) but a marked reduction in auditory perceptual processing. His visual perceptual abilities were markedly better than his auditory. A study of his background revealed that not only had he been taught by an auditory approach but that it had also been used in remediation. Dr. Wepman and his associates suggested a tutorial exposure to visual sight training; this was established with the result that the child's reading achievement advanced, and his acting-out behavior almost disappeared.

Further Conclusions

The studies, herein reported, span several decades -- the 1930's to the present. They show a continuing and expanding interest in the study of modalities. Though the subject is still controversial, it seems more or less open-ended. The Reading Research Quarterly[5], Volume XII, 1976-77, No. 3, Summary of investigations relating to reading, July 1, 1975, to June 30, 1976, offers a substantial number of studies dealing with modes of learning.

We still have children who cannot read and those for whom reading is extremely difficult; therefore, the people who seek answers are to be commended. However, the findings of some researchers seem "far-out" as far as their applicability to the public school situation as this writer knows it.

[5]An IRA publication

Further Implications

At this writing, large-scale modality grouping with the corresponding adaptation of method does not seem warranted. However, there is substantial and reliable evidence that individuals have profited by such a procedure.

Further research in modalities is needed -- a research that avoids the "pitfalls" of previous research and which explores a wider use of multiple modalities for reading instruction (visual, auditory, tactile, sapiditory, olfactory).

Improved aptitude tests are still felt, by some, to be needed -- tests that are more definitive and sensitive.

Perhaps more attention should be given to auditory perception, since reading, writing, and spelling have their base in spoken language. It might be wise, too, to consider at what point phonics should be introduced.

On the basis of case studies, offered by reliable people, in which method and modality were matched, a reclassification of children given labels such as "emotionally disturbed" or "mentally retarded" might be in order, as they might be perceptually handicapped children.

It might be wise to research the value of direct intervention in trying to improve the weak modalities.

In view of the fact that some disabled readers have a short attention span and a poor self-concept, it might be wise to consider different testing procedures.

Finally, researchers' findings should be explained in terms of their realistic applicability to a given situation.

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